Index

A1 adenosine receptors, 5
Abouleish, E., 134
Aceto, P., 81, 84
AEP technology. See auditory evoked potentials (AEP)
AEP-Index (AEpex), 126
A-Line ARX Index (AAI), 141
Alkire, M. T., 62, 65
alpha-2 adrenoceptors, 2
Alzheimer’s disease, 52
American Psychiatric Association, 191
American Society of Anesthesiologists on anesthesia awareness prevention, 151, 223
Closed Claims Project, 205, 213–217
electronic awareness registry, 91
Task Force on Intraoperative Awareness, 90, 209
amnesia, 47. See also explicit memory; implicit memory
anterograde amnesia, 54, 55, 66
basolateral amygdala mediation, 67
benzodiazepines and, 137
infantile amnesia, 172
light anesthesia and, 96–97
MAC and, 93
propofol/midazolam vs. thiopental/fentanyl, 54
sedation/unconsciousness vs., 114
amnesic potency, 53–56, 64
amnesics. See benzodiazepines; fentanyl; midazolam; propofol anesthesia; thiopental
analgesics. See fentanyl; meperidine; morphine; remifentanil
anesthesia. See also awareness; dreaming during anesthesia; individual anesthetic drugs;
light anesthesia; memory formation under anesthesia; memory function under anesthesia
delivery system malfunction/misuse, 94
episodic memory during, 48–49
goals of, 148–149
high-risk, avoidance of, 152–153
overly light anesthesia, 92–93
sedative components, 49–50
anesthesia indices. See anesthetic depth, indices
anesthesia information management system (AIMS), 216
anesthetic depth
brain function monitoring, 117–120
cesarean section deliveries and, 81
clinical assessment, 115–116
EEG/processed EEG monitoring, 140–143
and MAC, 138–139
monitoring (definition attempt), 114
monitors, 154–155
costs, 162
patient movement as, 155–156
OAA/S, 116–117
patient movement and, 138–139
anesthetic depth, indices, 124–127
AEP-Index, 126
A-Line ARX Index, 141
Autoregressive AEP Index, 126
Bispectral Index, 124–126, 140–142
Cerebral State Index, 126
emergence and recovery, 127–128
Index of Consciousness, 126
low index values, consequences of, 128
Narcotrend Index, 126
Patient State Index, 126
pitfalls/limitations of, 128
prevention of awareness, 127
principles of, 122–123
Response Entropy/State Entropy, 126
SNAP II Index, 126
technology/basic analysis, 123–124
anterior hypothalamus, 1, 2
anterograde amnesia, 54, 137
Antognini, J. F., 137
anxiety. See also University of Michigan Health System study
awareness with paralysis and, 178
benzodiazepines for, 137
CBT and, 198
dreaming during anesthesia and, 83
PTSD and, 190, 193, 194, 196, 212
and risks of under-/over-sedation, 227–228

© in this web service Cambridge University Press www.cambridge.org
Armstrong, D., 238
ASA Closed Claims Project, 213–217
ascending reticular activating system (ARAS), 2, 6, 84. See also wakefulness promoting systems
atropine, 80
attention of infants, 173
long-term memory and, 97
as prime determinant of memory, 49–50
top-down, and consciousness, 38–39
auditory evoked potentials (AEP), 81, 141. See also AEP-Index (AEPex); Autoregressive AEP Index (AAI)
basal of, 120
brain monitoring and, 152–153
pitfalls/limitations of, 122
technology/basic analysis, 120–122
auditory evoked response (AER), 58–59, 84, 158
Australia. See medicolegal consequences of awareness
authorship (perception of free will), 28
autism, 52
automated programs, 39
Autoregressive AEP Index (AAI), 126
Avidan, M. S., 127
awake paralysis, 213, 215, 217
awareness, xi–xii, 49, 150. See also awareness in children; medicolegal consequences of awareness; near-miss awareness; philosophical implications of awareness; undesired awareness
B-Aware Study, 161, 162
bilateral thalamic ILN lesions and, 34
B-Unaware Trial, 151, 161, 162
causes of, 149
causes (potential) of, 151–152
defined, 75, 114, 131–132, 222
depth of anesthesia monitors, 154–155
brain monitors, 158–163
costs, 162
gas analyzers, 156–157
dreaming as prelude to, 81
dreaming vs., 74, 76, 81, 83, 133–135
drug-induced paralysis and, 153–154
EEG/processed EEG monitoring, 140–143
high-risk anesthesia and, 152–153
historical background, 188, 189–190
history of, 132–133
identification of, 150
incidence determination, 133–135
inhalational anesthesia and, 152
inverse zombies and, 242–248
muscle relaxants and, 153
prevention of, 136–138
psychological impact of, 151
self-reports of, 134, 224
sources of expectations of, 228
TIVA and, 152–153
uncommonness of, 90
vs. memory, consciousness, 114–115
without explicit recall, 149–150
awareness, causes
increased anesthetic requirement, 93–94
malfunction/misuse of delivery system, 94
overly light anesthesia, 92–93
awareness, in children
causes, 179–180
consequences, 178–179
defined, 173–174
features of, 177–178
under five years of age, 183–184
management of, 181
prevention/monitoring of, 180–181
awareness, pharmacologic therapy, 136–138
benzodiazepines/dissociative agents, 136–137
neuromuscular blockade, 136
opioids, 137–138
awareness, risk factors
age-related, 94–95
anesthesia delivery systems, 94
anesthetic choice, 100–102
gender-related, 95
insufficient knowledge/lapses of vigilance, 104
laryngoscopy/intubation duration, 96
light-anesthesia, 96–100
for specific patient groups, 134–135
surgical choice, 102–104
weight-related, 95–96
basal forebrain
acetylcholine synthesizing neurons in, 6
adenosine receptor antagonist administration, 5
GABAergic neurons, 2
B-Aware Study, 81, 161
behavioral studies (of memory function under anesthesia)
amnesic potency, 53–56
classical conditioning, 56
implicit memory, 56–58
benzodiazepines, 54, 94, 98, 99, 103, 117, 136–137
Bereitschaftspotential (readiness potential), 28
bioherence technique, 160
bicuculline (GABA\textsubscript{A} antagonist), 4
bilateral deep brain electrical stimulation, of thalamus, 33
binocular rivalry (perceptual illusion), 35–36
Index

Bispectral Index (BIS), 58, 59–62, 81, 94, 97, 103, 124–126, 140–142, 160
Blacher, R. S., 189–190
Block, Ned, 236–237
body mass index (BMI). See weight-related risk factors
Bogetz, M. S., 102
BOLD fMRI (blood-oxygen-level-dependent functional magnetic resonance imaging), 33, 38, 62, 64, 65
Bowdle, T. A., 142–143
brain. See also awareness; consciousness; electroencephalogram (EEG); hypothalamus; pontine reticular formation; processed EEG; sleep systems; thalamus; wakefulness promoting systems
anterior hypothalamus, 1, 2
ascending reticular activating system, 2, 6, 84
basolateral amygdala mediation of drug-induced amnesia, 67
brain events/readiness potential, 28
dorsal raphe nucleus, 2, 4, 8
dorsolateral prefrontal cortex (DLPFC), 52
Hard Problem, 26
lesions affecting consciousness, 33–34, 51–52
medial temporal lobe (MTL), 51
mind-body problem, 24, 25–26
neurobiological approach to consciousness, 25
neurobiology of free will, 28–29
neuronal correlates of consciousness, 26–27
parietal activations, 52
split-brain studies, 34–35
thalamus, bilateral deep brain electrical stimulation, 33
vigilance (high state of arousal), 30
brain function monitoring. See also auditory evoked potentials; auditory evoked response; electroencephalogram (EEG) concerns with, 162–163
for detecting/preventing AWR, 156–157, 158–162
brain trauma, 33, 56
brainstem auditory evoked potentials (BAEP), 121
Bremer, Frédéric, 1
Brice, D. D., 76, 133, 134
Brice Questionnaire, 83, 95, 133, 134, 135, 150, 174, 177, 223–224
B-Unaware Trial, 151, 161
bupivacaine, 91
Burnside, B. A., 81
Byers, G. F., 174
Canada. See medicolegal consequences of awareness
Cary, Heling v. (standard of care case), 209–210
catecholamines, 94
Caton, R., 140
cerebral function monitors, 97
Cerebral State Index (CSI), 126
cesarean section deliveries, 61, 76, 81, 152, 188–189
awareness during/neuroaxial blockade, 139
case study description, 221
cognitive behavioral therapy (CBT), 197, 198–199
comatose state, 31
communication, neuronal basis of, 35–38, 40
consciousness. See also Chalmers, David; the hard problem (of consciousness); inverse zombies; Lewis, D.; McGinn, C.; philosophical implications of awareness brain lesions, affect on, 33–34
definition, philosophical, 25
development in children, 172–173
forward vs. feedback projections, 39–40
global disorders of, 31–33
global workspace model, 40
human brain example of, 25
information and attainment of, 52
information theory of, 41–42
loss of, sevoflurane induced/nicotine reversal, 2
neurobiological approach to, 24–25
neuronal correlates of, 26–27
in other species, 29–30
© in this web service Cambridge University Press
index 255
Cambridge University Press
978-0-521-51822-2 - Consciousness, Awareness, and Anesthesia
Edited by George A. Mashour
Index
More information

www.cambridge.org
consciousness (cont.)
phenomena encompassed by, 25–26
philosophy of
non-reductionism in, 233
physicalism in, 233
states of, and conscious states, 30–31
vs. awareness, memory, 114–115
continuous flash suppression, 35, 37–38
Crick, F., 26
Davidson, A. J., 135
De Andre, J., 226
declarative (explicit) memory. See explicit
(declarative) memory
Deeprose, C., 61
depth of anesthesia. See anesthetic depth;
anesthetic depth, indices
desflurane anesthesia, 55, 65, 79, 100
dexmedetomidine (selective alpha-2
adrenoceptor agonist), 2, 8
Diagnostic and Statistical Manual of Mental
Disorders (DSM-IV), 191
diazepam, 66
digital symbol substitution test, 223–224
dissociative agents, 136–137
Domino, K. B., 213
dopaminergic neurons, 8–9
dorsal raphe nucleus, 2, 4, 8
dorsolateral prefrontal cortex (DLPFC), 52
DPCPX (selective adenosine A1 receptor), 5
dreaming
during cesarean section deliveries, 76
in children, 84–85
home recall vs. anesthesia recall, 79
near-miss awareness and, 82
nitrous oxide and, 80
as prelude to awareness episode, 81
during sleep, 74–75
waking vs., 30
dreaming during anesthesia
awareness vs., 133–134, 135
AWR vs., 150
characteristics of, 82–83
in children, 175, 177
consequences of, 83
during elective surgery, 243
incidence of dreaming, 76
ketamine anesthesia, 80
memory vs., 133
near-miss awareness vs., 80, 84
postoperative management, 83
propofol-based anesthesia, 76, 79
dreaming during anesthesia, risk factors
anesthetic agents/other medications, 79–80
depth of anesthesia, 80–82
patient factors, 76–79
post-operative interview timing, 82
drug-induced paralysis and AWR, 153–154
Dutton, R. C., 56
electroencephalogram (EEG), 117–120. See also
anesthetic depth, indices; auditory
evoked potentials; auditory evoked
response; B-Aware Study; brain function
monitoring: B-Unaware Trial; evoked
potentials; positron-emission
tomography
during anesthesia, 84
basal forebrain neurons activation, 10–11
basis of, 117–118
burst suppression pattern, 118–119
grapho elements, 119
K-complexes, 119
limitations/pitfalls of monitoring, 119–120
MAC/children and, 180
memory function under anesthesia studies
auditory evoked response (AER), 58–59
biphasic index (BIS), 59–62
for monitoring anesthesia, 93, 140–143
in children, 180–181
multichannel comparisons (Massimini), 42
during NREM/REM sleep, 58, 74, 84
processed EEG devices, 140–143, 159
sharp waves, spikes, spike and wave patterns,
119
sleep spindles, 119
technology/basic analysis, 118–119
for TIVA monitoring, 152–153
vertex-wave patterns, 119
electro-oculogram (EOG), 74
EMDR. See eye movement desensitization
reprocessing
evergencephalitis lethargica, 1
end-tidal anesthetic gas (ETAG), 135, 142
ephedrine, 94
epidural anesthesia, 100, 106
epileptic seizures, 33, 52
episode memory, 48–49, 50, 51, 52, 53, 149
Errando, C. L., 99, 102
ether anesthesia, 153, 188
evergence-hypnosis-memory study (Levinson),
61
etomidate (GABAA agonist), 93, 100, 151
eVLPO (extended part of the VLPO), 2
evoked potentials (EP), 58, 117, 120–122, 158,
160. See also auditory evoked potentials;
brainstem auditory evoked potentials;
somatosensory evoked potential
evidence, reasons for. See the hard problem (of
consciousness)
explicit (declarative) memory, 48, 116
frequency in children, 175–177
eye movement desensitization reprocessing (EMDR), 197, 199
feelings
of agency (perception of free will), 28
of being underwater, 221
of detachment/estrangement from others, 192
of guilt, 194
of helplessness/panic, 153, 189
immaterial feelings, 24
of inverse zombies, 244, 245
of loss of control, 198, 199
meaning of/privacy of, 26
of paralysis, 101
PTSD-related, 199–200
of traumatic event reoccurrence (in children), 191
fentanyl, 54, 59, 62, 79, 97, 137, 138, 141, 152
flash suppression (perceptual phenomena), 37
free will, neurobiology of, 28–29
frivolous lawsuits. See medicolegal consequences of awareness
functional connectivity maps, 53
functionalism
Block’s qualia argument against, 236–237
and the hard problem, 235–238
undermining, 237
GABA_A agonists, 4, 11. See also muscimol
GABA_A receptors, 2, 4–5, 151
blockade of, 11
etomidate and, 93
presence in pontine reticular formation, 9
GABA_B receptors, 2
GABAergic neurons
in basal forebrain, 2
inhibition of wake-on, REM-off neurons, 4
rostral pontine reticular formation transmission, 6, 9–10
galanin, 2
gamma aminobutyric acid (GABA), 2, 4
gas analyzers, as monitors for AWR prevention, 156–157
Ghoneim, M. M., 222
global workspace model (of consciousness), 40
grapho elements (of EEG), 119
Gray, T. Cecil, 152
Guerra, F., 95
hallucinations
from ketamine anesthesia, 80
post-anesthetic, vs. dreaming, 75
from propofol anesthesia, 82
in young children, 191
halothane anesthesia, 7, 55, 141, 153, 174
the hard problem (of consciousness), 26, 234.
See also inverse zombies
easy problems and, 234–235
functionalism and, 235–238
neural mechanisms and, 238–240
philosophical zombies and, 240–242
Harris, R., 76, 83
Helen v. Cary standard of care case, 209–210
Hellwagner, K., 84
hemis-neglect syndrome, 35
Hilbert-Huang spectral entropy technique, 160
histaminergic neurons of tuberomammillary nucleus, 11
Hudetz, Anthony, 150
Hutchinson, R., 76
Hutchinson, Ruth, 188
Huycke, L. L., 206–207
Huycke, M. M., 206–207
hypocretinergic hypothalamic neurons, 11–12
hypothalamus. See also encephalitis lethargica;
reticular activating system and dexmedetomidine, 8
and histamine containing neurons, 11
hypocretinergic neurons in, 11–12
posterior, state dependent changes in GABA levels, 9–10
and REM sleep, 6
ventrolateral preoptic area of, 2
and wakefulness promotion, 6
implicit learning, PET-memory study, 57
implicit (nondeclarative) memory, 48, 56–58
in children, during anesthesia, 181–183
in children under five years old, 183
components of, 182
priming, 49
inattentional blindness, 35
Index of Consciousness (IoC), 126
indices of anesthetic depth. See anesthetic depth, indices
inferior temporal (IT) cortex, 36
infiltration anesthesia, 100
information, and attainment of consciousness, 52
information theory of consciousness, 41–42
informed consent, 151, 210–211, 225–226
inhalational anesthesia, 54, 66–67, 138. See also
B-Aware Study administration training, 92–93
cardiovascular disease and, 98
for cesarean section deliveries, 152
delivery systems, 94
Index

inhalational anesthesia (cont.)
EEG slow-wave pattern non-REM sleep and, 159
explicit memory formation and, 156
inverse-zombie reaction
mechanism of action, 149, 153
monitored anesthesia care and, 101, 106
with muscle relaxants, 148
nitrous oxide interactions, 100–101
obesity and, 96
opioids vs., for hypnosis, 152
tolerances to, 93
inhibitory avoidance (IA), 54
intraoperative awareness during general anesthesia. See awareness
intraoperative awareness in children. See awareness in children
intraoperative awareness with explicit recall. See awareness
inverse zombies, 148
detection of, 243
functionalism and, 245
implications of during general anesthesia, 244–246
metaphysical/methodological, 246–248
patient (Liska) example of, 244–245
philosophical vs., 234, 242
Iowa Satisfaction with Anesthesia Scale, 223–224
isoflurane anesthesia, 9, 12, 55, 56, 61, 99, 100, 139, 141, 153
isolated forearm technique (IFT), 49, 81, 116, 156
Johansen, J. W., 141, 142–143
Joint Commission on Accreditation of Healthcare Organizations, 104
on anesthesia awareness prevention, 151
on identification of high risk patients, 211
Katz, J. A., 102
K-complexes (of EEG), 119
Kerssens, C., 60, 61, 64, 65–66
ketamine anesthesia, 7, 80, 98, 99, 106, 137, 141
dreaming and, 80
Kissin, L., 139
Kiviniemi, V. I., 65
Koch, C., 26
LaRock, E., 242
laterodorsal and pedunculopontine tegmental (LDT-PPT) cholinergic neurons, 4, 6–7
lawsuits. See medicolegal consequences of awareness
learning and neuronal memory, 51
Levine, J., 241
Levinson, B. W., 61
Lewis, D., 236, 238
Libet, B., 28
light anesthesia, 82, 92–93, 96–100
awareness avoidance preventive measures, 97–100
for cesarean section deliveries, 92, 135
dose determination, 96–97
duration of awareness, 97
MAC and, 96–97
reasons for choosing, 96, 102–104
risk of muscle paralysis, 101, 154
Liska, Jeanette, 244–245
Liu, W., 95
Liverpool technique, 152
locus ceruleus (LC), 2, 4
noradrenergic neurons in, 7–8
REM-off discharge pattern, 4
Logothetis, N. K., 36
Lubke, G. H., 103
MAC. See minimum alveolar concentration
Macaque monkeys, image experiments, 36
Macleod, A. D., 189
magnetic resonance imaging (MRI), 62. See also BOLD fMRI
Magoun, Horace, 2, 6
malpractice claims. See medicolegal consequences of awareness
Mashour, G. A., 134, 224, 242
masking techniques, 35, 39, 40
Massimini, M., 42
Maycock, E., 189
McGinn, C., 239
medial temporal lobe (MTL), 37, 51, 56, 64
medicolegal consequences of awareness
ASA Closed Claims Project, 116, 205, 213–217
claim frequency to incidence relationship, 205
economic burden of legal claims, 212
future considerations, 217
informed consent standards, 151, 210–211
injury claims initiation, 204
international standards, 204, 206, 208, 209–210, 211
malpractice claim anatomy, 208
medical custom standards, 208–209
no-fault system option, 206
patient injury compensation claims, 205–208
PTSD claims, 212
standard of care, court determinations of, 209–210
meditative practices, 31
memory
vs. awareness, consciousness, 114–115
classical conditioning, 49, 56
declarative (explicit), 48
development in children, 172–173
encoding, consolidation, retrieval phases, 49
episodic memory, 48–49, 50, 51, 52, 53, 149
episodic/semantic, 48–49, 50, 51
explicit (declarative), 48, 116, 175–177
implicit (nondeclarative), 48, 56–58, 181–182, 183
neurobiology of
communication through coherence, 52–53
neuroanatomical correlates, 51–52
neuronal memory, 51
nondeclarative (implicit), 48, 56–58
priming, 49
postoperative, 61, 76, 132
prime determinants of, 49–50
procedural, 49
memory formation under anesthesia, 62–66
neural mechanisms, 66
emotional memory, 65
PET studies, 62, 64, 65
memory function under anesthesia, 47, 53–58, 62, 100
behavioral studies
amnesic potency, 53–56
classical conditioning, 56
implicit memory, 56–58
EEG studies
auditory evoked response (AER), 58–59
(bispectral index (BIS), 59–62. See also (Bispectral Index)
meperidine, 137, 138
Meyer, B. C., 189–190
midazolam, 54, 59, 66, 79, 98, 99
Miller, D. R., 99, 102
Milner, A. D., 91
mind-body problem, 24, 25–26
minimally conscious state (MCS), 31
vs. persistent vegetative state, 32–33
minimum alveolar concentration (MAC), 53, 92–93.
See also light anesthesia
age-related risk factors, 94–95
for Asians, Caucasians, Europeans, 93
calculation of, 138–139, 156
central catecholamine-increasing drugs and,
in children, 179–180
inhalation anesthesia and, 101, 106
light anesthesia and, 96–97
MAC-based replication study, 61
nitrous oxide additive MAC effect, 101
for red hair, 93
weight-related risk factors, 95–96
Modified Observer’s Assessment of Alertness/Sedation Scale (MOAAS), 117
Moerman, N., 189
monitored anesthesia care (MAC)
patient complaints, 221
self-report retrospective study, 224
morphine (mu opioid receptor agonist), 9, 137, 138
mechanism of action, 11
Moruzzi, Giuseppe, 2, 6
motion-induced blindness, 35
muscarinic anticholinergic drugs. See scopolamine
muscimol (GABA_A agonist), 2, 4, 11
muscle relaxants, 153
abuse of, 101
AWR and, 153
EMG changes from, 127
IFT and, 49, 81, 116, 156
with inhalational anesthesia, 148
light anesthesia and, 93
processed EEG and, 159
Winterbottom on dangers of, 91
Myles, P. S., 90, 103, 127
narcoleptic patients, 12
Narcotrend Index, 126
National Health and Nutrition Examination Survey, 91, 96
National Institute for Health and Clinical Excellence, 197
National Library of Medicine, 91
National Institute of Health and Clinical Excellence, 197
National Library of Medicine, 91
National Survey of Ambulatory Surgery, 91
near-miss awareness, 80, 82, 84
Necker cube, 35
neglect syndrome (visuo-spatial hemi-neglect), 35
nerve blocks, 100
neural mechanisms and the hard problem, 235, 238–240, 245
neurobiology of free will, 28–29
neurobiology of memory
communication through coherence, 52–53
neuroanatomical correlates, 51–52
neuronal memory, 51
neuromuscular blockade, 132, 135, 136, 139, 213
neuronal correlates of consciousness (NCC), 26–27, 35, 36–37
neuronal memory, 51
neurotransmitters. See aminoregulatory neurohormones, gamma-aminobutyric acid (GABA)
Index

New Zealand. See medicolegal consequences of awareness

nicotine, thalamic administration during anesthesia, 7

nitrous oxide (N₂O), 55, 93, 98, 100, 141. See also Gray, T. Cecil; Liverpool technique
alfentanil supplementation of, 101–102
and dreaming, 80
with fentanyl, 97
with isoflurane, 56
memory and, 65, 100–101
pediatric use, 174
with propofol, 101
tolerances to, 93

no-fault patient injury compensation system. See also medicolegal consequences of awareness

nondeclarative memory. See also implicit memory

non-rapid eye movement (NREM) sleep, 2, 4
adenosine promotion of, 5
brain activation patterns, 14
decreased Fos expression during, 10
dreaming during, 75, 83
EEG during, 58, 74
muscimol’s effect on, 11
norepinephrine and, 7
serotonin levels, 8

noradrenergic neurons in locus coeruleus, 7–8

obesity issues, 92, 96, 214–215

Observer’s Assessment of Alertness/Sedation Scale (OAA/S), 116–117, 223–224
opioids, 94, 98, 103. See also fentanyl;
meperidine; morphine; remifentanil
vs. inhalational anesthesia, for hypnosis, 152
mechanism of disruption of wake-sleep cycle, 7
natural/synthetic derivatives, 137–138
unreliability of, 152
Osterman, Janet, 189
overly light anesthesia, 92–93. See also light anesthesia

Paech, M. J., 134
parietal activations, 52
patient expectations, role/nature of implications
for awareness during general anesthesia, 230–231
for clinicians, 229–230
investigation of, 225–227
sources of expectations of awareness, 228
patient movement and anesthetic depth, 138–139

Patient State Index (PSI), 126

pediatric population
awareness during anesthesia, 94, 135,
188–189, 196–197
awareness/measuring awareness defined, 173–174
explicit memory frequency, 175–177, 181–182
implicit memory during anesthesia, 181–183
infantile amnesia, 172
memory/consciousness, development of, 172–173
recovery period dreaming, 84–85
wakefulness frequency, 174–175
Peltier, S. J., 65
perceptual illusion, 35
perceptual puzzles/questions, 38–39
peripheral nerve blocks, 100, 106
permutation entropy technique, 160
persistent vegetative state (PVS), 31
vs. minimally conscious state, 32–33
pharmacologic therapy in awareness, 136–138
benzodiazepines/dissociative agents, 136–137
neuromuscular blockade, 136
opioids, 137–138
phenomenal, subjective states. See neuronal correlates of consciousness (NCC)

Phillips, A. A., 99
philosophical implications of awareness. See also inverse zombies; philosophical zombies
the hard problem (of consciousness), 26, 234
easy problems and, 234–235
functionalism and, 235–238
neural mechanisms and, 238–240
philosophical zombies and, 240–242
philosophical zombies
Chalmers on, 240–241
and the hard problem of consciousness, 240–242
inverse vs., 234, 242
LaRock/Mashour on, 242
physicalism in the philosophy of consciousness. See also philosophical zombies
Chalmers’ objections to, 233, 235, 240
described, 233
Skinner and, 244
physostigmine (cholinesterase inhibitor), 7
10–11, 99
Plourde, G., 84
Pollard, R. J., 101, 134
pontine reticular formation
microinjections of cholinomimetics into (in cats), 7
presence of GABA₄ receptors, 9
and REM sleep, 5, 7, 9
rostral, GABAergic transmission in, 9–10
state dependent changes in GABA levels, 9–10
unilateral adenosine A1 activation, 5
positron-emission tomography (PET) memory formation under anesthesia, 62, 64, 65
memory study, implicit learning, 57
sevoflurane study, 65
postoperative memories, 61, 76, 132
posttraumatic stress disorder, from AWR, 151, 199–200
age, 194
assessment of, 196
cognitive behavioral therapy for, 198–199
criteria for, 191–192
EMDR, 199
gender, 193–194
legal claims for, 212
psychological/psychiatric factors, 194
risks for development, 192–193
severity of the trauma, 193
socioeconomic factors, 194
treatment for, 196–197
procedural memory, 49
processed EEG, 140–143, 159
property dualism, 246–248
propofol anesthesia, 5, 54, 59, 62–64, 79, 100, 137, 141
default mode network and, 66
dreaming during, 76, 79
sexual/hallucinations, 82
with nitrous oxide, 101
suppression of hippocampal long-term potentiation, 66
vs. general anesthesia, 5
Pryor, Kane, 64
Prys-Roberts, C., 139
psychedelic drugs, 31
psychological consequences of intraoperative awareness, xi, 194–196. See also posttraumatic stress disorder; undesired awareness
PubMed database (National Library of Medicine), 91
quale (qualia) of an experience, 25
Ramsey depth of sedation score, 223–224
Ranta, S., 206
rapid eye movement (REM) sleep, 2, 4, 30. See also locus ceruleus (LC); non-rapid eye movement (NREM) sleep
acetylcholine promotion of, 31
brain activation patterns, 14
cycling with non-REM sleep, 74
dreaming during, 75, 76, 83
EEG during, 74
EMDR and, 199
GABA levels during, 4
norepinephrine and, 7
opioid disruption of, 7
pontine reticular formation and, 5, 7, 9
serotonin levels, 8
readiness potential (Bereitschaftspotential), 28
regional anesthesia
for cesarean section deliveries, 102, 152
emotional distress from, 222–223
patient complaints from, 152, 222
risk of under-/oversedation, 227–228
undesired awareness during, 225, 226
remifentanil, 137, 138
REM-on group, Wake-on/REM-on group, 7
Response Entropy (RE), 126
reticular activating system (RAS), 33
risk factors, for awareness during general anesthesia
age-related, 94–95
anesthesia delivery systems, 94
anesthetic choice, 100–102
gender-related, 95
insufficient knowledge/lapses of vigilance, 104
laryngoscopy/intubation duration, 96
light-anesthesia, 96–100
surgical choice, 102–104
weight-related, 95–96
risk factors for dreaming during anesthesia
anesthetic agents/other medications, 79–80
depth of anesthesia, 80–82
patient factors, 76–79
post-operative interview timing, 82
Samuelson, P., 81–82, 224
Sandin, R., 93, 99, 189
Schiff, N. D., 33
schizophrenia, 52
Schwender, D., 59, 189
scopolamine, 7, 80, 99, 106, 137
Scoville, W. B., 91
Sebel, P. S., 91, 92, 141
self-reports of intraoperative awareness, 134, 224
“Sentinel Event Alert” (Joint Commission on Accreditation of Healthcare Organizations, US), 104
serotonin (5-HT) neurons, 8
sevoflurane anesthesia, 7, 10–11, 55, 65, 79
sexual dreaming (propofol anesthesia), 82
Silenced Screams (Liska), 244–245
Skinner, B. F., 244
sleep. See also non-rapid eye movement (NREM) sleep; rapid eye movement (REM) sleep homeostatic regulation, 5 neural network hypothesis, 1 vs. general anesthesia, 148 sleep systems, 1–6 adenosine/homeostatic sleep regulation, 5 basal forebrain GABAergic neurons, 2 brainstem nuclei/GABAergic transmission, 4–5 ventrolateral preoptic area/anterior hypothalamus, 2 sleep-like dreams (recovery periods), 84 Slow Wave Sleep. See non-rapid eye movement (NREM) sleep somatosensory evoked potential (SSEP), 120 Sperry, Roger, 35 spinal anesthesia, 100 State Entropy (SE), 126 Stickgold, R., 199 Stonell, C. A., 61 Studdert, D. M., 207 subjective states, 25, 26. See also free will NCC associated with, 27 in other-than humans, 29–30 supervenience, 24 Task Force on Intraoperative Awareness, 90 Taylor, F. H., 134 thalamic blockade, 119 thalamus, 6 bilateral deep brain electrical stimulation, 33 EEG and, 117–118 intralaminar nuclei (ILN), 33 lesions in, 25, 33–34 REM sleep and, 6 thalamo-cortical system, 40 thiopental, 54, 59, 62–64, 141 total intravenous anesthesia (TIVA), 101–102, 135, 152–153 tuberomammillary nucleus (TMN), 2, 11 Tunstall, M. E., 156 unconscious memory. See explicit (declarative) memory undesired awareness described, 222 detection of, 223–224 impact (potential) of, 222–223 patient expectations, role/nature of, 225–227 regional anesthesia and, 225, 226 risks of under-/over-sedation, 227–228 undesired intraoperative awareness United Kingdom. See medicolegal consequences of awareness United States anesthetic usage data, 1 JCAHO awareness data, 151 multi-center hospital awareness study, 134 National Health and Nutrition Examination Survey, 91, 96 University of Michigan Health System study, 225–227 ventilator/vaporizer-related problems, 215 ventrolateral preoptic area (VLPO) of the anterior hypothalamus, 2. See also eVLPO vertex-wave patterns (of EEG), 119 Veselis, R. A., 54, 59, 64 vigilance (high arousal states of brain), 30 visual processing in humans, 40 Von Economo, Constantin, 1 wakefulness, frequency in children, 174–175 wakefulness promoting systems, 6–12 cholinergic basal forebrain neurons, 10–11 cholinergic neurons in pontomesencephalic junction, 6–7 dopaminergic neurons, 8–9 GABAergic transmission in rostral pontine reticular formation, 9–10 histaminergic neurons of tuberomammillary nucleus, 11 hypocretinergic hypothalamic neurons, 11–12 noradrenergic neurons in locus coeruleus, 7–8 serotonergic neurons in dorsal raphe nucleus, 8 Waller, J. L., 137 Wang, L. Y., 115 weighted spectral median frequency technique, 160 weight-related risk factors, 92, 95–96, 214–215 Weiher, Carol, 223 Wennervirta, J., 99 Winterbottom, E. H., 91 xenon, 98 Yli-Hankala, A., 127 zombie behaviors, 39, 40. See also inverse zombies; philosophical zombies